

Final Programming Project
IS0020
Due: Monday, Aug 2, 2004

Your final constitutes two parts. First is this assignment which will be 80% of the final. Second will be a take-home quiz, which will be given to you after next class.

In this assignment, you will extend the implementation of 10.12 (the facility that we included for this problem should still be there too), to create a sort of database for a university. You will prepare a report to indicate your class design and indicate issues that you addressed, some of which are indicated below.

First, you will extend the hierarchy and restructure with new classes indicate as follows:

- Instead of `Employee` as the main base class, introduce `UniversityMember` as the main base class. That is `Employee` and its derived classes as in 10.12 will now be derived from `UniversityMember`.
- Introduce a class called `Course` to indicate what courses are available for registration. You will have a course number, title and level (graduate/undergraduate) for each course for each course. You should also indicate who is teaching it if it is currently offered – you are free to implement this part as you prefer.
- Introduce following new classes
 1. `Student` class
 - A `Student` is a `UniversityMember`.
 - Allow a student to be registered for upto 3 courses
 - Indicate the level of the student
 2. `GraduateStudentAssistant` class
 - A `GraduateStudentAssistant` is a `Student` as well as a `salariedEmployee` (*multiple inheritance*)
 - A graduate should can be employed for 20-hours or 10-hours. In the first case he gets full salary, say, between 12K and 16K, and in the second case, it will be half of that.
 - A GSA has either a teaching or a research assignment, which should be indicated, and has a `Professor` as a mentor.
 - Although not necessary if you prefer you can derive new classes to make it better
 3. `UnderGraduateStudentAssistant` class
 - An `UnderGraduateStudentAssistant` is a `Student` as well as a `hourlyEmployee` (*multiple inheritance*)
 - An `UnderGraduateStudentAssistant` can work for upto 20 hours.
 - There is minimum wage that should be used to indicate his earnings.
 4. `TeachingStaff` class
 - A `TeachingStaff` “is a” `salariedEmployee`
 - Each teaching staff teaches 3 courses
 5. `ResearchStaff` class
 - A `ResearchStaff` “is a” `salariedEmployee`
 - A `ResearchStaff` only does research. Indicate the research areas by listing upto 5 research project titles
 6. `Professor` class
 - `Professor` “is a” a `TeachingStaff` as well as a `ResearchStaff`

- A professor teaches 3 classes if he has less than 2 active research projects. He teaches 2 classes if he has 4 projects, and only one if he has 5 projects.
- For each class he teaches there is a GSA (either 20-hour or 10-hour)
- For each project, there are upto 3 GSAs

You will develop a nice interface with following menus:

- *Main Menu*: Should list following three submenus to go to:
 1. *Record Management Menu* that allows
 - Reading from and writing to appropriate files. You will design a set of files to appropriately store created objects – for instance, you may have a **course.dat**, **student.dat** to store course objects and student objects.
 - Creating and deleting objects and appropriately updating the associated files. You have to make sure that when you delete a particular object, you should update other objects. For instance, if you delete a course, you want to make sure that that course is not listed for any student or any teacher. Identify such cases clearly in your report.
 2. *Query Menu*: Should facilitate asking for particular type of information and return results. You need to implement the following, and can add more.
 - Queries from 10.12 related to earnings/income
 - Printing sorted information according to each class type.
 - List of teachers for a particular course
 - List of professors and their projects and courses they are teaching
 - Student list for a particular course
 - List the GSAs with teaching assignments and indicate the associated courses and the professor
 - List the GSAs with research assignments and indicate the professors they are assisting
 - Search for particular `UniversityMember` based on UID

You will use appropriate file-processing and STL features, besides other things you have learned in this course. In your report indicate reasons for choosing a particular method. Your report should be properly formatted, and describe the class design with short description of the functions. The report should clearly show your design and reasons behind each design choices (why random access or sequential access? Why vector/list/set? etc.)

You should first try to design all the classes. We did not cover multiple inheritance – for this read Section 22.9 (page 1201) for an example.

On Monday, you should be ready to discuss the concerns that you have. I will also try to make myself available whole of next week for you to drop by and discuss problems.

Good luck!